

Appendix C

Design Review Checklists

Biddability Review

Definition

Biddability is generally defined as the degree to which the design documents can be understood, bid on, administered, and enforced. The purpose of the biddability review is to ensure that the construction package is free of significant design errors, omissions, and ambiguities so that prospective bidders can respond in a reasonable manner and at a reasonable cost. In this review, the actual design is analyzed for consistency with the bid documents. The bid and design documents should be clear, comprehensive and manageable. The review also should assure that the bid documents provide a firm basis against which any claims may be evaluated.

Review Team

The contracting party is responsible for having the appropriate design reviews conducted. In-house reviews may be conducted if the requisite expertise is available or reviews may be sent to another agency or contractor. The designer should be awarded the review task if independent and objective reviews can be conducted. The biddability review focuses on the bid documents that accompany the drawings and specifications. The review is conducted by a review team of members fully experienced in contracting procedures and procurement regulations and policies. It is unnecessary to solicit review input from each of the engineering disciplines having design responsibility on the project.

Timing of the Review

The initial screening may occur at the completion of the intermediate design, but contract documents generally are not prepared until later. An earlier review may hamper the designer by disrupting the design effort and forcing premature contract package development. The detailed review should coincide with the prefinal design submittal to the contracting party. The review, when combined with other types of reviews (operability, constructability, claims prevention, and environmental), should take an average of five to ten working days.

Scope of the Review

The drawings and specifications serve three basic functions in project construction. First, they describe the proposed work so that bids can be compiled. Second, they establish the rules and guidelines for procuring materials and performing the construction. Third, they act as contractual documents in case of litigation.

A review of drawings and specifications during a biddability review is not done to determine their technical accuracy. Rather, this review focuses on the completeness and clarity of information. The drawings and specifications should provide adequate information of existing site conditions to enable the constructor to anticipate any problem areas. All data available to the designer should be available, at least by reference, to prospective bidders. Availability of utilities, adequacy of space for work areas, and disposal of excess material are all considerations that must be addressed in the drawings and specifications. Technical responsibilities of the constructor and contracting party for quality control, and requirements for submittal and review of deliverables must be clearly defined for each phase of work.

Unlike drawings, specifications typically include language from contract administration and non-technical provisions such as those found in the form of General and Special Conditions. These specification sections should be checked carefully, particularly regrading constructor submittal requirements, changed conditions, progress payments, and schedules. A sample checklist of remedial action (RA) bid documents is included

in this appendix as Attachment I. Contract development or legal counsel are the most qualified reviewers for these portions of the reviews.

The proposed RA schedule should include milestone dates and logic ties, particularly when multiple constructors must interface with each other. Experienced engineers with construction backgrounds can aid in evaluating the feasibility of performing the work within reasonable time-frames, and can assist in developing more logical and more biddable schedules.

The bid forms themselves should be examined for items such as logical organization (e.g., all earthwork bid items should be grouped together), proper units for bid item quantities, adequate definition of scope of each bid item, and appropriateness of estimated quantities and adequacy of the bid period. The reviewers must examine the contract documents from a constructor's viewpoint. The contract should fairly allocate risks between the constructor and the contracting party, to minimize the contingency included in the bid amounts.

The designer's interpretation of geologic data and the conditions expected to be encountered during construction should be provided in the specifications. Any interpretations made by the designer in assessing data along with the significance and associated implications for construction must be included. The specifications should also define those areas where uncertainties exist that may require changes during construction.

The use of "as directed" statements and disclaimers should be avoided whenever possible. "As directed" provisions allow for work under the contract that cannot be fully specified until the work is under way. Excessive use of these statements can infer greater unknowns and constructor risk than appropriate, resulting in higher bids.

General Overview

The purpose of the review is to check the final design for the following:

- Clarity and simplicity of the bid schedule
- Appropriateness of contract sequencing, relationship to other work, and contract performance period
- Real and possible conflicts among the drawings, specifications, bid forms, including terms and conditions
- Completeness and clarity of the bidding instructions
- Clear guidance for measurement and payment
- Established criteria for RA contract award
- Clear guidance for contract completion requirements, including penalties, rewards and incentives
- Clear guidance for change order administration
- Clear guidance for disputes resolution
- Appropriateness and consistency of material quantity units

A checklist is attached to provide additional detail to assist in a biddability review.

Attachment I

Checklist of Remedial Action Bid Documents

- ☐ Index of Bid Documents
- ☐ Advertisement for Bids
- ☐ Instructions to Bidders
- ☐ Bid Form
- ☐ Addenda Acknowledgement
- ☐ Bid Bond
- ☐ Certificate of Surety
- ☐ Acknowledgment of Principal Form
- ☐ Non-Collusion Affidavit
- ☐ Certification of Nondiscrimination in Employment
- ☐ Certification of Nonsegregated Facilities
- ☐ Authority to Execute Agreement
- ☐ Form of Agreement
- ☐ Performance Bond Form
- ☐ Payment Bond Form
- ☐ Certificate of Ability to Obtain Insurance
- ☐ General Conditions
- ☐ Supplemented General Conditions
- ☐ Federal Requirement and Agreement Provisions
- ☐ Davis-Bacon Wage Rate Determinations
- ☐ General Agreement Requirements (Special Conditions)
 - ☐ Scope of Work
 - ☐ Control of Materials
 - ☐ Utility Coordination Requirements
 - ☐ Project Supervision Requirements
 - ☐ On-Site Inspection Procedures
 - ☐ Safety Requirements, Responsibilities
 - ☐ Emergency Procedures
 - ☐ Progress Schedule
 - ☐ Payment Procedures (Measurement, Payment)
 - ☐ Change Order Procedures
 - ☐ Correspondence Distribution
 - ☐ Submittal, Processing Procedures
- ☐ Technical Specifications
- ☐ Drawings and Plans (certified by a Professional Engineer)
- ☐ Supplemental Data (e.g. geologic data, hydrologic data)

Design Review Checklist					
Project Title & Location: _____					
Design Phase: <input type="checkbox"/> Preliminary <input type="checkbox"/> Intermediate <input type="checkbox"/> Pre-Final/Final	Reviewer: Name _____ Organization _____ Telephone _____ Date _____				
Document Reviewed (Section/Paragraph)	Item No.	Component to be evaluated for completeness, clarity and appropriateness (provide comments on separate sheet)	Acceptability		
			Yes	No	N/A
		BIDDABILITY			
	1	Are specification divisions appropriate and per CSI format?			
	2	Are substitutions allowed as an "engineer (or owner) approved equal" to allow flexibility during construction?			
	3	Have the appropriate material and equipment standards been specified?			
	4	Does the review confirm that no sole source or brand name material or equipment has been specified?			
	5	Are terminologies and notations consistent among drawings, specifications, bid items?			
	6	Have appropriate construction techniques been specified?			
	7	Are cross references of drawings to specifications complete and accurate?			
	8	Has a description of materials and/or facilities provided by owner been included?			
	9	Has a description of items of work provided by each contractor for multiple contracts been provided?			
	10	Have the quality control responsibilities of contractor and quality assurance by owner been adequately addressed?			
	11	Have all submittal requirements (content, schedule) been identified, and are they appropriate?			
	12	Has owner review period for each submittal been identified, and is it reasonable?			
	13	Is the construction schedule feasible and clearly defined with schedule interface points identified?			
	14	Have completion times for distinct phases been specified?			
	15	Are the drawings complete (i.e., sufficiently detailed, clearly define the work)?			
	16	Are specifications complete?			

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Design Review					
Project Title & Location:					
Document Reviewed (Section/Paragraph)	Item No.	Component to be evaluated for completeness, clarity and appropriateness (provide comments on separate sheet)	Acceptability		
			Yes	No	N/A
	17	Should supplemental data be referenced on drawings or specifications? If so, has it been provided?			
	18	Have the cost/schedule monitoring requirements (i.e., progress reports) by contractor been clearly identified?			
	19	If off-site disposal of material by the contractor is required, have the contractor's responsibilities been clearly identified?			
	20	Has the division of work been clearly identified at contractor interfaces, where more than one contractor will be working at the site?			
	21	Does the bid package include all of the appropriate bid documents (see biddability review in this attachment)?			
	22	Is the structure of the bid form appropriate (i.e., are bid sections coordinated, defined, unambiguous)?			
	23	Do all bid items have appropriate units for measure and payment and are they consistent with the specifications?			
	24	Is the scope of work for each bid item clearly defined?			
	25	Has the accuracy of bid quantities for the work defined been verified?			
	26	Are the bid expiration periods stated and reasonable?			
	27	Have the criteria to be used as the basis for awarding the contract been clearly specified?			
	28	Has a review to ensure all the appropriate standard construction contract clauses been conducted?			
	29	Do the contract documents specify when ownership of contractor built or installed facilities transfers to the government or to the state?			

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Operability Review

Definition

The objective of this review is to determine whether the particular system or remedial facility will function in an optimal manner, as required by the design documents, and whether it can be maintained for its intended use. The operability review is a specialized review where only operations and maintenance issues are examined.

Review Team

The contracting party is responsible for having the operability review conducted. This review may be conducted by the contracting party, using in-house resources, an outside agency, or the designer, if an independent and objective review can occur. This review focuses heavily on process engineering, so the contracting party should ensure that the appropriate team is available.

Timing of the Review

The review should be on a continuous basis from the start of the design phase. Under ideal circumstances, the review should be an ongoing review performed at key points - preliminary, intermediate, and prefinal design phases. By using this approach, the focus of the review can change as the design develops. An example would be the review of the process or facility layouts in the Design Criteria Analysis. Adjustments could be suggested early in the process without causing major redesign cost.

Scope of the Review

An operability review assures that the completed project will conform to applicable performance and operations requirements by asking:

- Does the operation and maintenance manual conform with the drawings and specifications?
- Are the requirements stated for equipment, installation, adjustment, etc.?
- Are the specifications complete for pre-startup, checkout, and post-startup optimization?
- Have the warranties, guarantees, or other contractual requirements applicable to operation and maintenance of the project been reviewed?

Components of the design that should be evaluated to address the questions noted above are:

1. Process and Instrumentation Diagrams
2. Facilities and Process Equipment Layouts
3. Specifications review, to include General and Supplemental Conditions Review and Equipment Specification, Mechanical Specification, and Electrical Specification reviews

A checklist is attached to provide additional detail to assist in an operability review.

Design Review					
Project Title & Location:					
Document Reviewed (Section/Paragraph)	Item No.	Component to be evaluated for completeness, clarity and appropriateness (provide comments on separate sheet)	Acceptability		
			Yes	No	N/A
		OPERABILITY			
		Process and Instrumentation Diagrams			
	1	Are the various components in the overall process train compatible?			
	2	Is the process reliable? If not, have back-up systems been provided?			
	3	Have the critical sampling points for process monitoring been identified?			
	4	Does it appear that the proposed treatment system can be operated efficiently without the need for highly specialized training?			
	5	Are the operating requirements compatible with the intended levels for the proposed process?			
	6	Have control panels been centralized at one location? If not, is staffing adequate to man several posts?			
	7	Have alarm systems or comparable warning systems been provided in case of mechanical breakdown or system upset?			
	8	Does the selected equipment meet special needs (i.e., long term operation, acidic waste, low feed rates, etc.)?			
	9	Are there provisions for expansion if additional treatment capacity is required?			
	10	Is sufficient data collection and monitoring planned?			
		Facilities and Process Equipment Layouts			
	11	Are the process equipment and local control panels placed so the operator has easy access?			
	12	Have special materials, handling problems, (debris, dust, tree roots, wet soils, clay, etc.) been identified and addressed?			
	13	Are the items requiring routine maintenance accessible?			
	14	Are sampling valves and equipment accessible for operation checks and for preventive and demand maintenance? (If the equipment is hard to reach, it may not be maintained in a proper manner)			
	15	Have washdown and housekeeping requirements been specified?			

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Design Review					
Project Title & Location:					
Document Reviewed (Section/Paragraph)	Item No.	Component to be evaluated for completeness, clarity and appropriateness (provide comments on separate sheet)	Acceptability		
			Yes	No	N/A
		Specifications Review			
	16	Have the performance testing requirements for process equipment been specified?			
	17	Are equipment manufacturers' and constructors' warranties and guarantees required, and are they of reasonable duration?			
	18	Have the specific procedures for handling latent defects in process equipment been specified?			
	19	Do specifications address compliance with equipment safety codes?			
		General Requirements			
	20	Do the design documents specify submittal requirements for the equipment supplier O&M datasheets and for test results from factory tests?			
	21	Do the specifications include a requirement for completion of the O&M manual and a description of the type of equipment manufacturer services that will be required during the training start-up phase?			
	22	Do the specifications include the responsibilities of the constructor during the start-up phase?			
	23	Do the specifications include the necessary requirements for training maintenance personnel?			
		Equipment Specifications			
	24	Have factory testing requirements been specified?			
	25	Have installation requirements, alignments, adjustments, and lubrication requirements been addressed?			
	26	Have functional field testing requirements been specified?			
	27	Are there requirements for equipment labeling?			
	28	Has a list of manufacturer's recommended spare parts and special tools been specified?			
	29	Have requirements for manufacturers' certification or proper installation and performance been specified?			
	30	Have detailed manufacturer service requirements, including number of days spent on site and number of trips, been specified?			
	31	Have types of sampling equipment and their applications been included?			
	32	Is any of the equipment or are any of the materials more elaborate than needed (i.e., can other standard or off-the-shelf items be specified)?			

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Design Review					
Project Title & Location:					
Document Reviewed (Section/Paragraph)	Item No.	Component to be evaluated for completeness, clarity and appropriateness (provide comments on separate sheet)	Acceptability		
			Yes	No	N/A
		Mechanical Specifications			
	33	Do mechanical specifications comply with state and local codes?			
	34	Have test pressures been specified for piping?			
	35	Does the valve and specialty list include pressure ratings?			
	36	Is equipment soundproofing needed and specified?			
		Electrical Specifications			
	37	Have a sufficient number of 100 and 220/440 outlets (provided for maintenance purposes) been specified?			
	38	Is the system properly grounded?			
	39	Has cathodic protection been provided for equipment?			
	40	Is lighting adequate for O&M functions?			
	41	Has conformance with state and local electrical codes been specified?			
	42	Has power surge protection for equipment been specified?			

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Constructability Review

Definition

A constructability review is performed to enhance the "buildability" of the design. It allows for the evaluation of the design for accuracy and completeness. In addition, the review provides an opportunity to eliminate impractical and inefficient remedial action (RA) requirements as well as deficiencies in contract documents. The review must be thorough enough to ensure that drawings, technical specifications, and bid forms are unambiguous and compatible with each other. Projects designed with constructability in mind will result in the lowest possible contract price with a minimum risk to all parties. Attention to constructability also allows timely completion of the project with a minimum of contractor claims.

Review Team

The review should be conducted by individuals and organizations knowledgeable in construction techniques, materials, equipment application, and design requirements. This review could be performed using EPA in-house resources, another agency, or a contractor, as long as the review is impartial. The review team should devote approximately five to ten working days reviewing and discussing the design documents. A formal report is prepared to document review results.

Timing of the Review

The constructability review should be considered an interactive process, one that first occurs in the early design phases in order to be of optimum value. At the preliminary design phase, the constructability screening might consist of an initial brainstorming session to discuss various aspects of the proposed concepts, such as general accessibility, procurement policies, as well as a cursory review of sketches or preliminary drawings. At the intermediate design phase, the screening can be enhanced to include more detailed review of the drawings and specifications, including more specific information regarding construction methods and installation details. The most comprehensive review occurs upon submission of the prefinal design to the contracting party. However, as constructability is the focus of the earlier design efforts, this last review should proceed without surprises.

Scope of the Review

The design documents critiqued during a constructability review fall into the two major categories: drawings (civil, electrical, mechanical) and specifications (construction activities). Drawings are the primary source of guidance in the field for the RA, portraying the physical aspects of the facility or structure and showing the arrangement, dimensions, details, materials, and other information necessary for building the project. Reviewers must rely on their own experience in their disciplines to evaluate the drawings for clarity, completeness, compatibility with specifications, and ability to be understood by field personnel. Spot checks of drawings should be done for sensitivity of the design to construction.

In evaluating the specifications, reviewers determine that the specifications are sufficient to effectively communicate engineering information, quality control, performance periods, submittal requirements, and the relationship to other work.

When the review is complete, the review team should be prepared to answer the following:

- Are there any potential construction constraints imposed by the site or unusual site conditions which could affect the RA?
- What is the availability of local materials and possibility of procurement/schedule difficulties caused by long-lead items?
- What are the seasonal constraints and how will they affect the RA?
- Is there an accurate depiction of design structures and existing site conditions such as access, storage and utilities?
- Is there a lack of prescribed procedures for critical work or excessive detailing on drawings?
- Evaluation of accuracy of any estimated quantities?

A checklist is attached to provide additional assistance when performing the constructability review.

Design Review					
Project Title & Location:					
Document Reviewed (Section/Paragraph)	Item No.	Component to be evaluated for completeness, clarity and appropriateness (provide comments on separate sheet)	Acceptability		
			Yes	No	N/A
		CONSTRUCTABILITY			
	1	Are there any potential construction constraints imposed by the site or unusual site conditions which could affect the RA?			
	2	Are the seasonal constraints that will affect the RA identified?			
	3	Is there an accurate depiction of design structures and existing site conditions such as access, storage and utilities?			
	4	Is there a lack of prescribed procedures for critical work, excessive detailing on drawings?			
	5	Have existing utility locations been identified (water, sewer, electrical, telephone)?			

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Claims Prevention Review

Definition

A claims prevention review eliminates conflicts, inconsistencies, ambiguities, errors, omissions, or other identifiable problems in the drawings and specifications and contract documents that are subject to contract modifications and constructor claims. A construction claim is a written demand or assertion to the contracting party by the constructor seeking, as a matter of right, additional money, a time adjustment, or other change in contract requirements. For purposes of claims prevention, the complexities can be reduced to basic claim types and a prevention program designed around those basis claim types. The purpose of the review is to identify causes or events which could lead to claims.

Review Team

The contracting party is responsible for having the appropriate design reviews conducted. The review can be conducted by the contracting party, other federal agencies, or the designer (if independent and objective reviews can be performed). The claims prevention review should be performed by those with experience in construction contracts management, usually resident field engineers and contracting officers.

Timing of the Review

The claims prevention review is a one-time review conducted before contract solicitation. The review should occur upon the submission of the prefinal design to the contracting party. The review is performed in conjunction with other specialized design reviews (biddability, operability, constructability reviews).

Scope of the Review

The scope of the review is limited to an administrative review. The following questions should be evaluated when reviewing the drawings and specifications and the contract documents:

- Is the contract clear, complete, and enforceable?
- Does the contract language use the common and normal meaning of words?
- Have contract documents been reviewed to ensure that conflicts do not exist among sections?
- Have the architectural and engineering disciplines taken sufficient precautions to ensure the design is reasonably free of errors?
- Do the contract documents adequately support the terms of payment selected (i.e., fixed-price or cost reimbursement)?
- Does the contract adequately explain the contract and consequences it contains for the contracting party and constructor?
- Are criteria for constructor selection clear and fair?
- Are performance standards complete, adequate, and unambiguous?
- Is there a remedy and procedure for changes?
- Are the estimated quantities reasonable?
- Is the site (and soils investigation) and disclosure of technical information adequate?

A checklist is attached to assist in conducting a claims prevention review.

Design Review					
Project Title & Location:					
Document Reviewed (Section/Paragraph)	Item No.	Component to be evaluated for completeness, clarity and appropriateness (provide comments on separate sheet)	Acceptability		
			Yes	No	N/A
		CLAIMS PREVENTION			
	1	Is the contract clear, complete, and enforceable?			
	2	Does the contract language use the common and normal meaning of words?			
	3	Have the contract documents been reviewed to ensure that conflicts do not exist among various sections?			
	4	Have the architectural and engineering disciplines taken sufficient precautions to ensure the design is reasonably free of errors?			
	5	Do the contract documents adequately support the terms of payment selected (i.e., fixed price or cost reimbursement)?			
	6	Does the contract adequately explain the contract and consequences it contains for the contracting party and constructor?			
	7	Are the criteria for constructor selection clear and fair?			
	8	Are the performance standards complete, adequate, and unambiguous?			
	9	Is there a remedy and procedure for changes?			
	10	Are the estimated quantities reasonable?			
	11	Is the site (and soils investigation) and disclosure of technical information adequate?			

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Environmental Review

Definition

The environmental review ensures that the design will meet the technical requirements of the Record of Decision (ROD) and that there is consistency between the implementation plans and current regulatory and policy requirements. The review also determines the adequacy of documents that address potential environmental releases during construction and contingency plans. The review does not re-evaluate potentially applicable or relevant and appropriate requirements (ARARs) but determines if the design incorporates adequate technical and administrative steps to meet the ARARs identified in the ROD.

Review Team

The contracting party is responsible for having the appropriate design reviews conducted. The review can be conducted by the contracting party, other federal agencies, or by the designer if an independent and objective review can be performed. The RPM (with appropriate representation from other EPA offices) and the state, however, are the most qualified to undertake this review. Regardless of who performs the review, the designer is not absolved of professional liability as the result of this review. If the design proves to be deficient, the designer may be held liable for errors or omissions in the design.

Timing of the Review

The environmental review should occur late enough in the design process so that technical details sufficient to judge process effectiveness or achievement of standards can be reasonably determined. The performance standards for the design should be included by the designer in the design criteria analysis. The ARARs should be determined as early as possible in the design effort to prevent redesign effort.

Scope of the Review

An environmental review seeks to address the following:

- Is there compliance with all applicable or relevant and appropriate environmental and public health requirements identified in the ROD?
- Are currently accepted environmental control measures and technology utilized?
- Are all substantive permit requirements clearly identified in the design along with the means of demonstrating compliance?
- Have all required off-site permits been applied for by the designer?
- Does the design require the constructor to comply with the off-site disposal rule (Section 121(d)(3) of CERCLA)? Are back-up facilities required in the event that the primary disposal facility goes out of compliance with the Resource Compensation and Recovery Act?

A checklist is attached to assist in conducting an environmental review.

Design Review					
Project Title & Location:					
Document Reviewed (Section/Paragraph)	Item No.	Component to be evaluated for completeness, clarity and appropriateness (provide comments on separate sheet)	Acceptability		
			Yes	No	N/A
		ENVIRONMENTAL			
	1	Is there compliance with all applicable or relevant and appropriate environmental and public health requirements identified in the Record of Decision?			
	2	Are currently accepted environmental control measures and technology utilized?			
	3	Are all substantive permit requirements clearly identified in the design with a description of the means of demonstrating compliance?			
	4	Have all required off-site permits been applied for by the designer?			
	5	Does the design require the constructor to comply with the off-site disposal rule (Section 121(d)(3) of CERCLA)? Are back-up facilities required in the event that the primary disposal facility goes out of compliance with the Resource Compensation and Recovery Act?			
	6	Are all performance standards clearly identified?			
	7	Has perimeter air monitoring been specified?			
	8	Are dust and noise control measures specified?			

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